

Research Article

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Process Optimization of the Selected Business Using a Process Approach

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ABSTRACT

The aim of our research was to optimize the existing process approach of the selected small business (SME), due to the desire for long-term effectiveness, cost-efficiency, and market competitiveness. SMEs have several specific characteristics related to their limited size, lower level of diversification, low capital strength, limited market, and higher risk. On the other hand, they are more flexible, as they can adapt quickly to new conditions, have closer contact with customers and are very important for economy employment. Due to inevitable need of business management improvement and performance optimization, a process snapshot was performed to obtain the existing process approach. Based on the snapshot, identification of critical points was perpetuated, which enabled obtaining basic decision-making information. Based on the latter, a critical analysis of necessary furtherance's was carried out: improvements of specific activities and elimination of redundant or unnecessary activities. For the purpose of real SME environment improvement of performance, we made a proposed problem solution, which represents an improved and optimized process approach for all of the fundamental processes of the company, based on the ISO 9001:2015 standard. Proposed optimized process approach was implemented immediately but gradually. The results were measured based on the overall number of proposed improvements (through the implemented renewed process approach) and the number of improvements that had been implemented by the time this research was conducted. It is estimated that the proposed solution has already been implemented (certain activities completely, others partially) in 62%. Even due to the partial implementation of optimized process approach, the business's results have improved. This is reflected in increased market demand by 7% due to more efficient, faster order fulfillment and increased income by 3,5%, compared to the previous two years. The latter emphasizes the importance of a process approach implementation, which affects the improvement of productivity and efficiency, increases knowledge sharing amongst employees, enables collaborative workplace, flexibility and agility of the company, easier compliance with regulations, improves customer experience, reduces costs, and enables higher revenues.

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Introduction

Logistics is a planning orientation and framework that seeks to create a unified plan for the flow of products and information through business. Supply chain management is based on this framework and seeks to link and coordinate the other stakeholders' processes in the channel (Christopher, 2005). According to Ayers (2001), supply chain includes those processes that cover a wide range of activities, including the supply, production, transport and sale of physical products and services.

Due to the volume of work in companies, it is very important that they try to optimize internal processes as much as possible. Such optimization enables the company to produce products more efficiently and will reach customers in a timely manner at lower costs. Digitalization has an important role in this, which until recently was focused on conversion of data to digital form (Butt, 2020a). Today, it places emphasis on organizational (or rather business) processes, which with technologically induced changes enable better functioning within companies and markets (Khan, 2016). Even though digitalization enables improved production processes, based on modern technologies, many manufacturing companies struggle to adapt digital technologies and management innovations into their business operations. The reasons for this may be different, from lack of knowledge (Basl, 2017; Machado et al., 2019), unable to perceive the technological benefits (Sarı et al., 2022; Butt, 2020b), lack of financial resources or support and many others. In our case, the researched production company has insufficient financial resources for the introduction of modern technology, primarily due to their size. For this reason, we decided to introduce an improvement that does not require a large financial investment, but can significantly improve the company's operations. Thus, a case study of the selected boutique production company's processes was perpetrated. Based on existing process approach snapshot and review of current state, critical analysis was carried out. For the intention of improving business and competitiveness, we introduced an improved process approach based on ISO 9001:2015 standard. The research question of our paper is whether the proposed process approach will meet the needs of the selected SME and they will be ready to implement it into their business. Thus, this paper focuses on practical application of the process approach within a company rather than on literature review. The reason for this is extensive and detailed research about current state of the process approach and the proposal for an improved one.

Processes

Ardolino et al. (2018) state, that the role of digital technologies in business transformation is under researched, although the implementation of modern technologies has resulted in improvement of productivity and efficiency, increased knowledge sharing and collaborative workplace, flexibility and agility, easier compliance with regulations, better customer experience, reduced costs, and higher revenues (Moran, n. d.). One of the main challenges is correlated to identification of the targeted performance objectives (Butt, 2020a), which vary from company to company. Consequently, this leads the digital transformation projects to cost-driven initiatives which cannot support or deliver any real business model transformation (Moeuf et al., 2018; Heavin & Power, 2018).

Efforts focus on the use of digital technologies for the purposes of transforming manufacturing value and supply chains (Butt, 2020a), which require large data sets processing in order to support decision-making processes. The correlation between different business processes has to be understood in order ensure connectivity and to accurately identify the required technologies. The latter will ensure the development of the whole company, adding value for customers and internal processes (Ardito et al., 2019; Frank et al., 2019).

The "process model" (Cornelissen, 2017) is an important approach, although relatively poorly understood (Cloutier & Langley, 2020). It involves the mechanisms by which activities are conducted in a time interval (Cornelissen, 2017). Nevertheless, there has been considerable debate (Cloutier & Langley, 2020) about exactly what does the term "process" theoretically mean or what should it include (Langley & Tsoukas, 2016; Van de Ven & Poole, 2005). Consequently, it seems like there is no single recipe for development of informative processes' conceptualizations (Cloutier & Langley, 2020).

Based on ISO standard, a process can be defined as "a set of interconnected or interacting activities that convert inputs into outputs" (ISO 9000:2008), with activities requiring the necessary resources allocation. The generic process consists of defined input requirements, that are interconnected through various activities and control methods, which then provide the met output requirements or the process result (ISO 9000:2008). The outputs of one process are often the inputs of other processes and are interconnected throughout the system. Each process has specific control and measurement control points (CP) that are necessary for management and vary according to the risks associated with the process (ISO 9001:2015).

Process approach

The ISO 9001:2015 standard is based on seven quality management principles: customer focus, leadership, engagement of people, process approach, improvement, evidence-based decision making and relationship management. Based on the standard, a process approach helps the company plan its processes and their interaction. The ISO 9001:2015 standard encourages the adoption of process approach in developing, implementing, and improving the performance of the quality management system to improve:

- Their operations and to increase customer satisfaction by meeting their requirements.
- Management of the processes' interconnections and interdependencies in the system.

The use of process approach in a quality management system thus allows understanding of requirements and their consistent fulfillment, addressing processes in terms of added value, achieving successful process implementation, and improving processes based on data and information evaluation. Process approach enables better insight into business operations through detailed control of processes, and can not only improve, but is also a prerequisite for optimization of business management and performance. Therefore, a company must establish, document, implement and maintain a quality management system and continuously improve its efficiency in accordance with the requirements of ISO 9001:2015. Thus, a company must determine the number and type of processes required to meet its business objectives. The number and type of processes vary from company to company, but typical processes can still be identified as: business

management processes; resource management processes; realization processes; and measurement, analysis, and improvement processes (ISO 9000:2008).

With process approach, control over processes is enabled and it can be used for their optimization. This is evidenced by examples of the process approach application, such as: land suitability procedure for sustainable citrus planning using the application of the analytical network process approach and GIS (Zabihi et al., 2015); multi-criteria risk evaluation by integrating an analytical network process approach into GIS-based sensitivity and uncertainty analyses (Ghorbanzadeh et al., 2017); a process approach about operationalizing stakeholder engagement in corporate social responsibility (Lane & Devin, 2017); an analytic network process approach for valuation of urban industrial land (Aragonés-Beltrána et al., 2008); a grey analytic hierarchy process approach to project manager selection (Çelikbilek, 2018); a process analysis approach to adopt robotic process automation (Leshob et al., 2018); digital twin-based process reuse and evaluation approach for smart process planning (Liu et al., 2018); a process approach about developing students' writing skills in English (Druga & Rao, 2018); a process-based approach to psychological diagnosis and treatment (Hayes et al., 2020). As seen in the listed examples, the process approach can be used in all spheres of operation, business and also teaching.

Methodology

The research is focused on a selected SME, which presents boutique production company, that is engaged in the production of products made of plexiglass material. Their services include the production of a wide variety of plexiglass products for both domestic and business use: accessories for households, offices, and manufacturing plants. They regularly produce products, such as various stands for mobile phones or paper, protections for machines in production plants, cabinets or small tables made of plexiglass material, decorations, business gifts, notice boards and much more. During the pandemic, there was an increased production of protective glass for offices, shops, and classrooms. Due to the small number of employees, limited financial resources and high market demand, the selected SME has failed to introduce a process approach so far.

The research began with the current state of the studied boutique manufacturing company of plexiglass products. We divided the current state into a snapshot, which covers all the fundamental processes of the company; a critical analysis, which we performed based on the snapshot and an interview with employees. The snapshot of the current state primarily enabled obtaining an objective picture of company's processes, based on which the current operations situation was evident. The creation of optimal plan and operations organization of the company was enabled. The snapshot included:

- Identification of critical points, their causes, and consequences.
- Obtaining basic decision-making information.
- A quick search for potential solutions that can be implemented immediately.
- Elimination of redundant or unnecessary activities.

This paper researched only company's fundamental processes; thus, it was limited to the internal company's processes. An integral part of the company's existing process approach is the large number of simple as well as complex processes within which various activities take place.

Therefore, the current process approach has been divided into five fundamental processes: procurement; demand and supply; custom product production; retail product production; product handover and sale.

The snapshot of current process approach is presented as flowchart, which shows the selected processes execution using graphic symbols. With the selected charting software, a custom legend was created to facilitate the flowcharts understanding, explaining the used symbols meanings:

- An ellipse, indicating the process beginning and end.
- An arrow, indicating the course, entry or exit into or out of the activity or process.
- A rectangle, indicating the activity or process taking place.
- A rhombus, indicating the CP where decisions are made.

Critical analysis of the selected processes is presented on an overview basis of individual processes and their activities, employees' interviews, and cooperation with the CEO, which has been obtained during the snapshot performance. Critical analysis provides insight into individual internal fundamental processes and activities, consequentially revealing potential challenges and obstacles within the processes. The primary purpose of critical analysis was to determine how the processes can be optimized.

Results

With process optimization, we eliminated ineffective and redundant activities while including optimized activities, which would help with efficiency of SME's business. As mentioned, the selected company has five fundamental processes. Each will be shortly presented with significant improvements, and one of the processes will be presented in more detail as an example of research. The selected process for detail description is Demand and supply process.

Procurement process

Procurement process began with inspection of warehouse stock of materials manually. For this activity, we proposed the improvement of implementation of material recording by a computer system. The procedure would take place when the material is taken directly from the warehouse and / or by issuing an invoice to the customer. As part of this improvement, the implementation of a computerized invoicing system is suggested, which would record the amount of plexiglass material used for a product. The amount of produced waste material would also be recorded in the program – this would not be visible on the customer's invoice. Such recording would update the material stocks quantity on an ongoing basis, which eliminates the need to manually review materials stock, enables real-time data and employees' time optimization.

Ordering necessary materials is done by the CEO, which is done based on the manually fulfilled table of material inventory. As second improvement, we propose the implementation of the Kanban system, which manages lean Just-in-Time production. It was developed to improve production efficiency through the main advantage of the system – setting a permissible stock limit to avoid low or high stock levels (Wallace & Spearman, 2004). The CEO would specify and determine the allowed minimum and maximum materials stock limit as, for example, for transparent plexiglass material at 40% (this material type is used on daily basis), and for non-regular plexiglass material

at 10%. When the stock of transparent plexiglass material would reach 40% or less, the system itself would report a shortage through the computer system. This proposal represents the basis that the company should implement in its business operations, as most companies already use the Kanban system. An upgrade would be for the system to communicate the material shortage directly to the supplier, which saves time in placing the order.

After these activities, ordered material is delivered and inspected by its type, quantity, quality, and price. If any perceived, material ordering activities are repeated. If all the material has met the criteria, the delivery note is signed, and an invoice is accepted. The material is then transferred to warehouse room, where it awaits production.

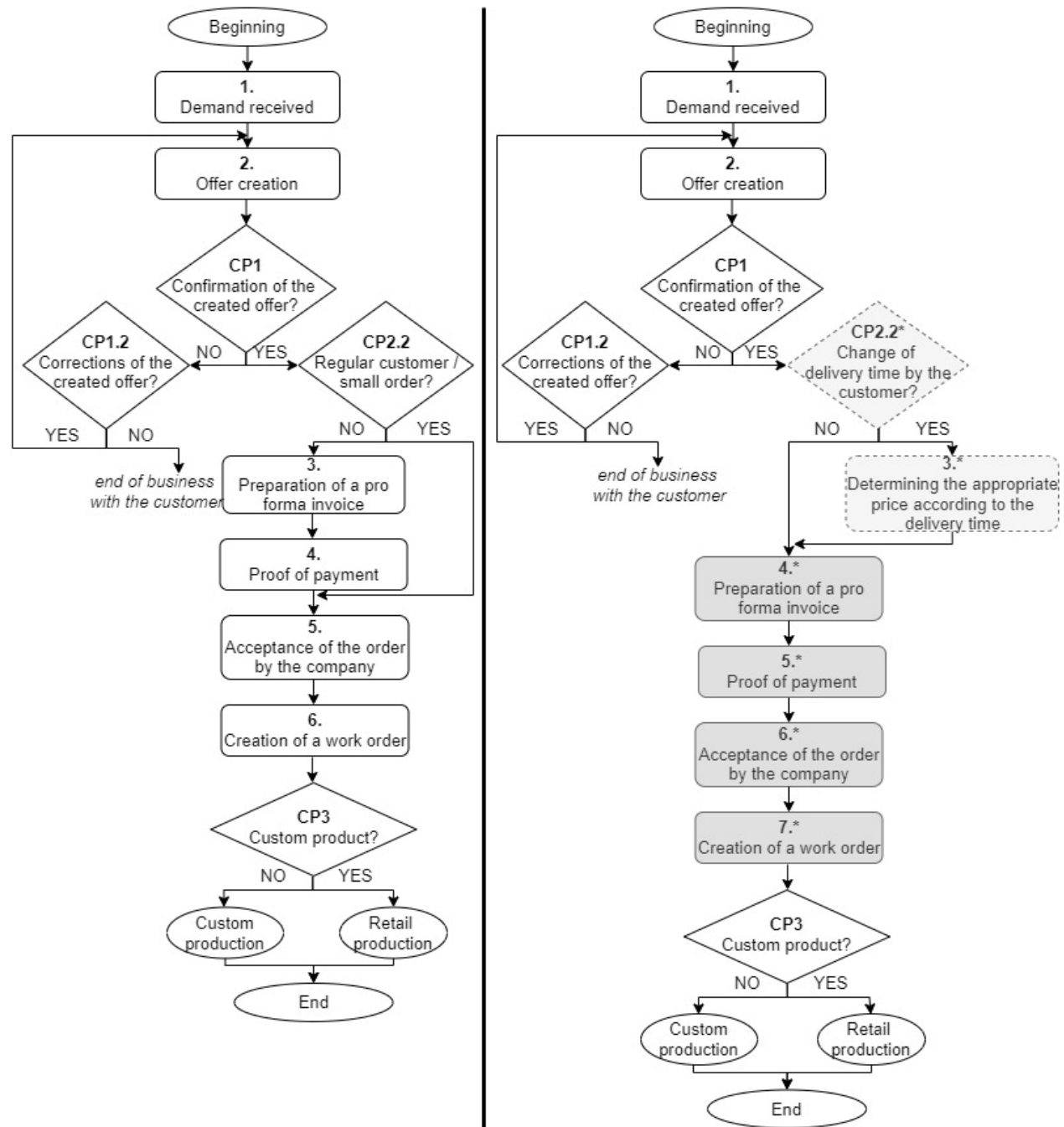
Demand and supply (and sale) process

A well-established procurement process is irrelevant if the market does not need plexiglass products. Therefore, the process of demand and supply (Figure 1, left side) is of considerable importance for the successful operation of the selected SME.

Customers and regular partners demands are mostly the CEO's domain; thus, he is responsible for reviewing demands (Activity 1.) and preparing offers. However, certain demands or offers are also regulated by employees. Correspondence with customers is done via email or over the phone. Demand is reviewed and an offer is made on its basis (Activity 2.). The latter must include information on the material type, its quantity, the time of production or the estimated time of product completion, and its price. The regular delivery time of finished products in this SME is approximately 14 days. The product price includes materials and labor costs. The offer is then forwarded to the customer, who must confirm it (CP 1). If the customer does not confirm the made offer, corrections or changes can be made, so the process continues in the re-making of the offer (CP 1.2). In this case, the customer needs to provide new information, specifying the change (e.g., product's physical characteristics), in order to make a new offer. It is also possible that the customer does not agree with the made offer and/or does not want corrections, in which case the business with the said customer is terminated. When the customer is satisfied with the prepared offer, he must provide the SME with an order form, which contains information about the ordered quantity of material or product and personal data.

Figure 1.

Current demand and supply process (left side) and improved Demand, supply, and sale process (right side) flowcharts



In the current process of demand and supply, the CEO checks whether the customer is their regular customer or if it is a small order upon receipt of the order (CP 2.2). In the event that the customer is new, or they are not a regular customer, or if the order is larger, a pro forma invoice is made (Activity 3.). Once the latter has been paid and the SME receives the proof of payment (Activity 4.), they verify the identity of the receipt in accounting. This is followed by an order

confirmation from the SME (Activity 5.). If the customer is their regular customer or the order is smaller, the activities of issuing a pro forma invoice and proof of payment are redundant. In the past, this has already caused many headaches for the SME. It rarely happened that the customer did not accept the product. The reasons are very different: the customer went bankrupt at the time that product was made, or the customer forgot about the order, and did not need it later on. At the time of the pandemic, the company found that doing business based on the type of customer (regular or not) or based on the size of order (big or small order) was not always smart. If the customer does not want to accept the product, the company would be protected in case of payment of the pro forma invoice. Even in times of crisis, partners or regular customers can take advantage of a charitable company that they trust because of their many years of cooperation.

In the improved demand, supply, and sale process (Figure 1, right side), we have integrated the sales process, which is last in the current process approach. This was done based on the challenges that arose in cases of non-payment and non-acceptance of products. Even when doing business in "normal" circumstances, such customer behavior has caused challenges for the SME, and in times of increased workload, it is necessary to eradicate customer irresponsibility.

As mentioned, the regular delivery time of a finished product is about 14 days – depending on the product's complexity. However, customers can be impatient, customers expect the product within two days, sometimes even the same day. In the past, customers were in a hurry, which led to overtime work. In the end, the customer did not come for the product for another two weeks. Which represents the first improvement of this process: if a customer wants a different delivery time, they must be willing to pay for it. As an example, we would like to propose three possibilities of delivery time and price increase for custom products (the customer must agree with the set price):

- Delivery time is one week – the product price is 10% higher.
- Delivery time is one day – the product price is 40% higher.
- Delivery time is three weeks or more – the product price is 5-10% lower.

Thus, this improvement would enable customers to decide, whether they want a different product time delivery (Activity 3.*), for which they must pay. The company has already tried to introduce such a system, where it turned out that pre-production of the product is no longer so important if it requires additional payment. Nonetheless, whether the customer decides to shorten the product's delivery time or not, they need to pay a pro forma invoice, regardless of their seniority or order size (Activity 4.*). Consequentially, this is our next proposed improvement. As before, the customers have to send proof of payment of the settled pro forma invoice. When the company receives proof of payment (Activity 5.*), the customer's order can be accepted by the company (Activity 6.*). Thus, the SME would no longer have issues with defaulters or unclaimed finished products, as the work order (Activity 7.*) would be made only in the case of a settled pro forma invoice and only then, the product production process would start. Based on the order and the order form, the CEO must select the right production process (CP 3), which is divided into two parts: custom product production process and retail product production process. The activities then continue in the next process.

Thus, the improved CPs and activities of this process are:

- CP 2.2 was a review of the customer's seniority and order size. Although the company conducted this CP based on trust, it brought many challenges in nonpayment of orders. The main reason businesses can survive is for customer to pay for their services. Due to fast-paced life, adaptation is necessary on both sides, from companies and customers. Thus, introducing the improved CP 2.2*, which enables the customers to select, if needed, delivery time of finished product. The latter is conditioned with higher costs for a shorter production time, or lower costs for a longer production time.
- Activity 3.* takes place after CP 2.2* and dictates the price for shortened product delivery time, which are described above (costs are 10% higher, 40% higher or 5-10% lower).
- Activity 3. is shifted one level forward and becomes Activity 4.*. The same goes for Activity 4., which becomes Activity 5.*, Activity 5. becomes Activity 6.* and Activity 6. becomes Activity 7.*.

The proposed improvements of individual activities are meant to better protect the company from unscrupulous customers, while allowing the possibility for customers to receive the product earlier if they are willing to pay for it.

Custom and retail product production process

The production process is divided into two parts: custom product production process and retail product production process.

In the first mentioned process, they manufacture products to customers' orders and are different with each new customer. As an example, we can mention the protection made of plexiglass, which separates people from each other. Such protections were used during the pandemic in shops, salons and in educational institutions.

In the second mentioned process, they manufacture products for the purpose of mass sale, such as racks for sheets or drawers, coasters, and document boxes, and whole or cut and optionally processed plexiglass panels. Both processes have some similar respects. Both start with distribution of work orders among employees, who then prepare the necessary materials for machine or manual processing. Due to the relatively modern technology, they can process semi-finished products in different ways, depending on the needs of the final product. Methods of processing include: processing on a CNC machine (milling); laser cutting and / or engraving; mechanical or thermal bending (method used depends on the material); diamond grinding; thermal or manual polishing; manual milling with milling machines; joining or gluing a large number of semi-finished products.

After each of the activities, employees constantly check the products quality and whether it was damaged during the process. The finished product is then packaged and protected with foil, which protects it from various damages and weather conditions. The packaged finished product is then transported to the pick-up point, where it awaits the customer's arrival.

We concluded that visible production process improvements cannot be introduced at the moment. This does not mean that improvements are not possible. The proposed improvements of this process includes both custom and retail production. And rather than activities, we set about striving for improvements based on overall production, such as new employments, employee trainings,

improvement of machinery and equipment layout, purchase of newer, more modern machinery and equipment.

Product handover and sale process

Both parts of the production process are combined when the custom product or retail product is transported to the pick-up point, which represents the beginning of the fifth and last selected process in the SME – the process of handover and sale. The customer must be notified about the finished product they have ordered.

Upon product receipt, the customer has to decide whether to take over the product. They may decide to not accept the product. Therefore, the product would be stored on the SME's premises until further sale, if possible, and thus completes the process of handing over the product. The customer is still required to pay for the product, which is not always easy to achieve, and for smaller amounts it is not worth initiating legal proceedings. If the product could not be resold, we have introduced a renewed activity that includes product recycling. The SME could engage in business with external service providers (3PL) or suppliers who would recycle such products for material reuse purposes. Material costs and the negative environmental impacts that an improperly discarded product may have would be reduced. In this case, 3PL would pick the abandoned product and recycle it. There would be no need for payment demand from customers, since the customer had to pay a pro forma invoice, thus insuring the SME against loss. A customer who wants to accept their product must first inspect it when visiting. If any errors are detected, it is first determined who the perpetrator was – the SME or the customer. If the product is not manufactured correctly, the fault-finding process from the current process state is repeated and the product is returned to production. Properly made product can be accepted by the customer.

This is where the issue of the delivery note currently takes place. In the first renewed process, we mentioned recording the inventory amount by issuing an invoice. As an improvement, we would suggest the introduction of a computerized invoicing system, which would record the amount of plexiglass material used. Such recording would update the inventory on an ongoing basis, which eliminates the need for manual checks, enables up-to-date data and optimizes used time. The SME issues three copies of delivery notes – one for the customer, one for accounting department and one for themselves. Setting up a computerized invoicing system would save the space needed to store delivery notes, shorten the time to search for old invoices, increase their transparency, and reduce the environmental impact of paper consumption. The product handover process optimization has enabled a simplified invoicing system, which now takes place only once. The customer would only receive the product receipt. We have integrated the sales process into the demand and supply process, thus turning this improved process into a product handover process.

Discussion

The current process approach has been divided into five fundamental processes: procurement; demand and supply; custom product production; retail product production; product handover and sale. The proposed improved process approach has all the fundamental processes, but with slight name changes: procurement; demand, supply, and sale; custom product production; retail product

production; product handover. This minor change in the name of processes has enabled a lot of fundamental changes, which would help the company to operate more optimally in the future, without the unnecessary challenges they have faced so far. With process approach optimization, we eliminated ineffective and redundant activities while including improved activities, which would help with efficiency of SME's business.

Proposed process improvements

In addition to all the already proposed improvements, we detected a lack of one of the most important activities in the procurement process, which is demand forecasting. The demand forecast can be calculated based on past sales data. An example of such calculations model is ARIMA, which allows various settings based on the SME's needs. The most up-to-date information for future demand can be obtained from large amounts of data. The more values entered, the more accurate the calculation will be – data for consecutive years, where monthly, weekly, or daily data are entered. Thus, the SME would avoid in-bulk purchases and the material shortage challenges. We also mentioned the implementation of a computerized invoicing system. Even If the latter is not implemented, the materials stock reviewing and demand forecasting would be assigned to the CEO, who regulates the necessary materials purchase. Despite the non-implementation of the computer system, implementation of demand forecasting is strongly recommended. Obtained past sales data represent the foundation to prepare and create a purchasing plan, which is one of the most important parts of the SME's business plan. The latter specifies the exact material requirement quantities, the calculation of orders number and their cost. At this point, the CEO decides whether a material order is necessary. If not, the procurement process ends here. In the case of an affirmative answer, a review of suppliers' offer on e-public procurement website follows. This activity is not imperative with every order, but it is recommended to execute it every few months, since it checks various suppliers offers, which change with time. The use of e-public procurement or e-purchasing is similar process to using consumer goods (Collins, 2012). It starts with browsing the suppliers' websites of the selected material. The comparison and purchase website can be visited to compare prices. The SME's material requirements are specified to suppliers on the website, and the process ends with a transaction via electronic payment. This option provides the benefits for CEOs by helping them communicate with suppliers and potential suppliers, reducing time spent on writing e-mails, costs of purchased goods, and the administrative costs associated with transactions. The process is faster and at the same time encourages better communication. As part of online sales, we would suggest consideration of their offer submission on the aforementioned e-procurement websites, where companies and customers work at auctions collectively. Both would enable shorter processing time for receiving product orders. We are of the opinion that both the implementation of the SME's online store and participation in online sales platforms would enable the SME's recognition and increases business.

In the improved demand and supply process, we have integrated the sales process, which evolves it into demand, supply, and sale process. This was done based on the challenges that arose in cases of non-payment and non-acceptance of products. The initial activities remained the same, as introduced improvements were found towards the end of the process. Arranging demands and offers

would be left to the CEO so that employees can have more time for products production. If the company would employ more than one person, the demands and offers could be arranged by an employee. Among the significant improvements are the information about expected delivery time and the payment of a pro forma invoice for all customers. During the pandemic, the SME determined that doing business without a pro forma invoice is not always wise. Thus, the SME would no longer have issues with defaulters or unclaimed finished products, as the product production would start only in the case of a settled pro forma invoice. And latter, if the customers decide to not accept the product, the SME would be protected by the pro forma invoice payment.

After each of the activities in both productions processes, employees constantly check the products quality and whether it was damaged during the process. The sooner they notice damage or irregularity, the sooner they can start the process again, which reduces the cost of materials, used labor, as well as save time. Existing control is a good sign of the SME 's operations quality and that employees take their work seriously, in the desire to meet customers' needs. The SME has a small number of employees (CEO and two employees). Optimizing the time of a small number of employees with a large workload is extremely complex. Therefore, as a first major improvement in the production process, we would recommend employment of at least two people to help with the work process. Thus, e.g., an employee would not need to stop working on their products for the purpose of software scheme creation. The latter could be made by another employee. For the purposes of the smooth production process, employee training would also be needed (e.g., how to make software schemes). This would relieve the employees, as more employees would be familiar with the work procedures, use of machinery and equipment. The layout of machinery and equipment on the SME's premises could also be improved – these could be followed in the order that most often takes place during production process. Improvements are also needed in the areas of machinery, equipment, and technology. One of the proposals is the purchase of newer, more modern machinery and equipment, which would facilitate the work process. The employees want automated band saws, with which they would no longer have to perform many manual tasks. The reduced production time would enable more time for other work in the SME. Employee morale would rise, and labor costs would be reduced, as faster work processes would not require overtime.

Because the SME is not always able to sell whole plexiglass panel, they can be left with waste material. This is partly included in the price of the material per square meter, but the full cost of waste is not reimbursed. Sometimes, a customer needs just such a piece, which belongs under the waste material. The said piece is sold for a lower price and the customer can take it immediately. The strategy of waste material management is very good, as the SME tries to have as little waste material as possible, which reduces the cost of ordering, its disposal, and contributes to their income at the expense of waste.

Implementations of the proposed improvements

A little less than two years after the original research, where we reviewed the selected SME's current process approach, we checked the status of the SME today. We were particularly interested in how many of the proposed improvements the SME managed to implement into their business operations.

The results were measured based on the overall number of proposed improvements and the number of improvements that had been implemented by the time this research was conducted. In order to achieve tangible results, we prepared a table where we divided the proposed changes into seven areas, within which there are 25 proposed improvements. The seven areas were: In general; Procurement; Demand, supply, and sale; Production; Handover; Online store; Process approach. Each of the areas had from one to six proposed improvements. We evaluated the implementation of improvements using a three-point scale: 0 for non-implementation, 0.5 for partial implementation, and 1 for total implementation. We decided for the partial implementation on the basis of the fact, that some of the improvements take a longer period of time to be implemented in total.

Despite the increased workload, the SME has implemented demand forecasting in this year, which allowed yearly finance planning, that has been divided into materials, equipment, machinery, employees and other. The yearly finance planning is a key component for the implementation of all other improvements, as without a financial plan it is more difficult to make even the smallest changes. Although the optimized process approach has not been fully implemented, the partial implementation has made it possible to plan financial investments into (currently) one new employee position, purchase of a tablet for the purpose of software and graphic schemes design, and new machinery such as CNC laser and automated band saws.

The research question of our paper was whether the proposed process approach will meet the needs of the selected SME and they will be ready to implement it into their business. Based on the response of the CEO and employees of the company, we can conclude the research question with a confirmation, as they immediately started implementing some of the suggested improvements. Thus, the proposed optimized process approach was implemented immediately but gradually. It was estimated that the proposed improvements have already been implemented (certain activities completely, others partially) in 62 %. Even due to the partial implementation of optimized process approach, the business's results have improved. This was reflected in increased market demand by 7% (from previous year forward) due to more efficient, faster order fulfillment and increased income by 3,5%, compared to the previous two years.

The modern technologies enable smart process planning, which is becoming the focus for lowering time constraints and costs. Evaluating the complex process knowledge is widely accepted as an effective strategy for improving competitiveness of companies, although there is not enough research on how to reuse and evaluate process knowledge. (Liu et al., 2019)

Conclusion

Up-to-date and detailed procurement planning enables inventory and procurement costs reduction with efficient production process. Thus, through optimized procurement planning, it is possible to coordinate purchasing activities with production. The main advantage of process approach, compared to others, is in the processes and activities' management and interactions control. For the most possible business optimization, it is necessary to harmonize all processes with the SME's objectives, scope, complexity, and design them to add value. Using a process approach can improve a SME's performance. Processes are managed as a system defined by a network of processes and

their interactions, which creates a better understanding and transparency of the entire system, which allows its optimization and consequent increase in added value.

Every company has the need to be competitive in the business market, especially today, when facing the consequences of the COVID-19 pandemic. For this purpose, the current process approach of the selected company was reviewed. Based on the latter, a proposed solution of optimized process approach was made and described in this paper. We presented in more detail the process of demand and supply, which was renamed in the proposed improved process into demand, supply, and sale. The reason for why we have decided to describe this process in more detail lies in the challenge that the SME has been dealing with – the issue of payment for manufactured products on a large scale in the last two years (even before, but not to such extent). Customer requirements, demands and expectations must, of course, be met, but in today's world, the saying "customer is king" is no longer so strong that companies should jeopardize their very existence in order to meet these requirements.

Based on the obtained data we also propose some suggestions for further development. The first proposal for future research would include examining the market for raw material processing providers (3PL) for the purpose of material recycling. Based on the latter, another research proposal would be a study on the processing of plexiglass material into raw material. If obtaining permits, setting up suitable business premises and the business process itself does not require large investments, the studied SME could start this process implementation into their business. In addition, waste materials could be purchased from other competitors. The raw material would then be sold to companies operating in the field of plexiglass casting. If these companies were also their supplier, the price level would vary from the price of other companies. Thus, the market demand for recycling of plexiglass material would be met, the studied SME would gain new knowledge and competitiveness, consequently the opportunity for more income under its auspices, whilst reducing the environmental impact.

As last future research proposal would be researching external company's processes, which would require the cooperation of business partners, stakeholders, and customers, which represents a more complex acquisition and processing of data. Although, the latter would enable optimization on a broader scale, across a larger number of organizations in the SME's entire supply chain, it would consequently provide significant opportunities for even greater optimization of the selected SME, which would present a feedback effect and the entire supply chain as a whole and thus greater competitiveness in the market.

The improvements made in the researched company emphasize the importance of a process approach implementation, which affects the improvement of productivity and efficiency, increases knowledge sharing amongst employees, enables collaborative workplace, flexibility and agility of the company, easier compliance with regulations, improves customer experience, reduces costs, and enables higher revenues. The benefits of process approach implementation are also evident from the literature, where Leshob et al. (2018) describe the process analysis approach to adopt robotic process automation, that automates repetitive human tasks using robots. The paper is focused on designing a new method, which firstly analyzes business processes and then verifies if they are suitable for automation using the robotic process automation approach. The research was still at an

early stage, but it established guidelines to advance a long-term research project. Liu et al. (2019) take the process approach a little bit further with the proposal of a novel digital twin-based approach for reusing and evaluating process knowledge for smart process planning. Bensmaine et al. (2014) presented a manufacturing system for integrating process planning and scheduling for different operations and, with the possibility to reconfigure the system. Li et al. (2014) presented automatic generation of process models, based on feature working steps and cutter volumes. Kumar et al. (2015) presented the automatic extraction method of manufacturing information and process parameters.

The process approach is part of the ISO standards, which are applicable in all areas, regardless of the business field or the size of the company, the process approach is also applicable for all purposes and in every company, as also evidenced from the presented examples.

References

- Aragonés-Beltrána, P., Aznar, J., Ferrís-Oñate, J., & García-Melón, M. (2008). Valuation of urban industrial land: An analytic network process approach. *European Journal of Operational Research*, 185(1), 322-339. <https://doi.org/10.1016/j.ejor.2006.09.076>
- Ardito, L., Petruzzelli, A. M., Panniello, U., & Garavelli, A. C. (2019). Towards Industry 4.0: Mapping digital technologies for supply chain management-marketing integration. *Business Process Management Journal*, 25(2), 323-346. <https://doi.org/10.1108/BPMJ-04-2017-0088>
- Ardolino, M., Rapaccini, M., Saccani, N., Gaiardelli, P., Crespi, G., & Ruggeri, C. (2018). The role of digital technologies for the service transformation of industrial companies. *International Journal of Production Research*, 56(6), 2116-2132. <https://doi.org/10.1080/00207543.2017.1324224>
- Ayers, J. B. (2001). *Handbook of Supply Chain Management*. The St. Lucie Press/APICS Series.
- Basl, J. (2017). Pilot study of readiness of Czech companies to implement the principles of Industry 4.0. *Management and Production Engineering Review*, 8(2), 3-8. <https://doi.org/10.1515/mper-2017-0012>.
- Bensmaine, A., Dahane, M., & Benyoucef, L. (2014). A new heuristic for integrated process planning and scheduling in reconfigurable manufacturing systems. *International Journal of Production Research*, 52(12), 3583-3594. <https://doi.org/10.1080/00207543.2013.878056>
- Butt, J. (2020a). A Conceptual Framework to Support Digital Transformation in Manufacturing Using an Integrated Business Process Management Approach. *Designs*, 4(3), 17. <https://doi.org/10.3390/designs4030017>
- Butt, J. (2020b). Exploring the interrelationship between additive manufacturing and Industry 4.0. *Designs*, 4(2), 13. <https://doi.org/10.3390/designs4020013>
- Çelikkilek, Y. (2018). A grey analytic hierarchy process approach to project manager selection. *Journal of Organizational Change Management*, 31(3), 749-765. <https://doi.org/10.1108/JOCM-04-2017-0102>
- Christopher, M. (2005). *Logistics and Supply Chain Management – Creating Value-Adding Networks (3rd Edition)*. Pearson Education Limited.
- Cloutier, C., & Langley, A. (2020). What Makes a Process Theoretical Contribution? *Organization Theory*, 1(1). <https://doi.org/10.1177/2631787720902473>
- Collins, K. (2012). *An Introduction to Business (v. 2.0)*. Online edition: 2012 Book Archive.
- Cornelissen, J. P. (2017). Developing propositions, a process model, or a typology? Addressing the challenges of writing theory without a boilerplate. *Academy of Management Review*, 42(1), 1-9. <https://doi.org/10.5465/amr.2016.0196>
- Durga, V. S. S., & Rao, C. S. (2018). Developing Students' Writing Skills in English - A Process Approach. *Journal of Research Scholars and Professionals of English Language Teaching*, 2(6), 1-5.

- Frank, A. G., Mendes, G. H., Ayala, N. F., & Ghezzi, A. (2019). Servitization and Industry 4.0 convergence in the digital transformation of product firms: A business model innovation perspective. *Technological Forecasting and Social Change*, 141, 341-351. <https://doi.org/10.1016/j.techfore.2019.01.014>
- Ghorbanzadeh, O., Feizizadeh, B., & Blaschke, T. (2017). Multi-criteria risk evaluation by integrating an analytical network process approach into GIS-based sensitivity and uncertainty analyses. *Geomatics, Natural Hazards and Risk*, 9(1), 127-151. <https://doi.org/10.1080/19475705.2017.1413012>
- Hayes, S. C., Hofmann, S. G., & Ciarrochi, J. (2020). A process-based approach to psychological diagnosis and treatment: The conceptual and treatment utility of an extended evolutionary meta model. *Clinical Psychology Review*, 82, 101908. <https://doi.org/10.1016/j.cpr.2020.101908>
- Heavin, C., & Power, D. J. (2018). Challenges for digital transformation—towards a conceptual decision support guide for managers. *Journal of Decision Systems*, 27(Suppl. 1), 38-45. <https://doi.org/10.1080/12460125.2018.1468697>
- ISO 9000:2008. *ISO 9000 Introduction and Support Package: Guidance on the Concept and Use of the Process Approach for management systems*. Standard.
- ISO 9001:2015. *Quality management systems — Requirements*. Standard.
- Khan, S. (2016). *Leadership in the Digital Age: A Study on the Effects of Digitalisation on Top Management Leadership (Master's Thesis)*. Stockholm: Stockholm University.
- Kumar, S., P., L., Jerald, J., & Kumanan, S. (2015). Feature-based modelling and process parameters selection in a CAPP system for prismatic micro parts. *International Journal of Computer Integrated Manufacturing*, 28(10), 1046-1062. <https://doi.org/10.1080/0951192X.2014.953586>
- Lane, A. B., & Devin, B. (2017). Operationalizing Stakeholder Engagement in CSR: A Process Approach. *Corporate Social Responsibility and Environmental Management*, 25(3), 267-280. <https://doi.org/10.1002/csr.1460>
- Langley, A., & Tsoukas, H. (2016). *The Sage handbook of process organization studies*. London: SAGE Publications.
- Leshob, A., Bourgouin, A., & Renard, L. (2018). Towards a Process Analysis Approach to Adopt Robotic Process Automation. *2018 IEEE 15th International Conference on e-Business Engineering (ICEBE)*, 46-53. <https://doi.org/10.1109/ICEBE44866.2018>
- Li, J., Chen Z., & Yan, X. (2014). Automatic generation of inprocess models based on feature working step and feature cutter volume. *The International Journal of Advanced Manufacturing Technology*, 71(1-4), 395-409. <https://doi.org/10.1007/s00170-013-5507-7>
- Liu, J., Zhou, H., Tian, G., Liu, X., & Jing, X. (2018). Digital twin-based process reuse and evaluation approach for smart process planning. *The International Journal of Advanced Manufacturing Technology*, 100, 1619-1634. <https://doi.org/10.1007/s00170-018-2748-5>
- Machado, C. G., Winroth, M., Carlsson, D., Almström, P., Centerholt, V., & Hallin, M. (2019) Industry 4.0 readiness in manufacturing companies: Challenges and enablers towards increased digitalization. *Procedia CIRP* 2019, 81, 1113-1118. <https://doi.org/10.1016/j.procir.2019.03.262>
- Moeuf, A., Pellerin, R., Lamouri, S., Tamayo-Giraldo, S., & Barbaray, R. (2018). The industrial management of SMEs in the era of Industry 4.0. *International Journal of Production Research*, 56(3), 1118-1136. <https://doi.org/10.1080/00207543.2017.1372647>
- Moran, K. (n. d.). *Benefits of Industry 4.0*. Available online: <https://slcontrols.com/benefits-of-industry-4-0/> (accessed on 15 August 2022).
- Sarı, T., Güleş, H. K., & Yiğitöl, B. (2020). Awareness and readiness of Industry 4.0: The case of Turkish Manufacturing Industry. *Advances in Production Engineering & Management*, 15(1), 57-68. <https://doi.org/10.14743/apem2020.1.349>
- Van de Ven, A. H., & Poole, M. S. (2005). Alternative approaches for studying organizational change. *Organization Studies*, 26(9), 1377-1404. <https://doi.org/10.1177/0170840605056907>
- Wallace, H., & Spearman, M. L. (2004). To Pull or Not to Pull: What Is the Question? *Manufacturing & Service Operations Management*, 6(2), 133-148. <https://doi.org/10.1287/msom.1030.0028>

Zabihi, H., Ahmad, A., Vogeler, I., Nor Said, M., Golmohammadi, M., Golein, B., & Nilashi, M. (2015). Land suitability procedure for sustainable citrus planning using the application of the analytical network process approach and GIS. *Computers and Electronics in Agriculture*, 117, 114-126. <https://doi.org/10.1016/j.compag.2015.07.014>

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Conflict of Interests

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